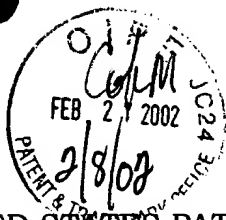


5694.P055



Patent

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Tzu, et al.

Serial No. 09/829,506

Filed: April 9, 2001

For: LEADFRAME PACKAGE WITH
DUMMY CHIP

Examiner: Alcalá, J.

Art Unit: 2841

Box Non-Fee Amendment
Commissioner for Patents
Washington, DC 20231

AMENDMENT AND RESPONSE

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Sir:

In response to the first Office Action mailed October 10, 2001, the Applicants request the Examiner to enter the following amendments and to consider the following remarks.

IN THE SPECIFICATION:

Please replace the paragraph beginning at page 4, line 8, with the following rewritten paragraph:

--FIGURE 2 is a top view of a structure of a leadframe package according to an embodiment of the present invention.--

Please replace the paragraph beginning at page 4, line 10, with the following rewritten paragraph:

al
cont

--FIGURE 3 is a top view of a structure of a leadframe package according to another embodiment of the present invention.--

Please replace the paragraph beginning at page 4, line 14, with the following rewritten paragraph:

a2

--The present invention discloses a novel structure of a package 100. FIGURE 1 is a cross sectional view of the structure of the package 100 of the present invention. FIGURE 2 and FIGURE 3 are respective top views of two different embodiments of the present invention.--

Please replace the paragraph beginning at page 6, line 16, with the following rewritten paragraph:

a3

--Still turning to FIGURE 2, a tap 28 is used to fix the inner leads 12. Another embodiment is illustrated in FIGURE 3, the example includes the dummy chip 18 fixed by a few inner leads 12a adhesive tapes 18. Alternate distribution of the inner leads 12a and 12b can improve the yield, especially high-density wire bonding. Further inner leads 12b are set outside the dummy chip 18, the die is connected to the inner leads 12b by means of bonding wires 24.--

Please replace the paragraph beginning at page 4, line 20, with the following rewritten paragraph:

a4

--As shown therein, the package 10 includes a lead frame 100 without conventional die paddle to receive the die. The lead frame 10 has inner leads 12 and outer leads 14. In the present invention,

all
cont.

molding material (compound) 16 encapsulates a die 20 and a dummy chip 18 configured as a stacked structure. The dummy chip 18 is arranged on a lower portion of a molding compound 16 and a lower surface of the dummy chip 18 may be exposed. The dummy chip refers to a substrate without IC formed therein. Preferably, the material for the dummy chip 18 includes but is not limited to silicon. The dummy chip 18 may be fixed by the tapes 28 adhesive on the inner leads 12 of the lead frame 10. The dummy chip 18 includes one or more pads 22 configured around the surface of the dummy chip 18 to connect the inner leads 12. The die 20 is stacked on the upper surface of the dummy chip 18 by using adhesive material 26. The benefit of the present invention is that the metal sink is omitted, which may reduce manufacturing costs. Further, die paddle is not necessary for the present invention. The dummy chip 18 is exposed by the molding compound, which can improve the efficiency of spreading heat. General speaking, the die 20 generates a lot of heat during operation. The dummy chip 18 promotes thermal generated by the die 20 away from the die 20.--

IN THE CLAIMS

Please amend Claim 1 as follows:

1. (Amended) A leadframe package with dummy chip comprising:

a leadframe package with a plurality of first leads;

a molding compound;

ab
Cont
a dummy chip and a die, wherein said molding compound encapsulates said die and said dummy chip, said dummy chip being arranged on a lower portion of said molding compound, said die being stacked on an upper surface of said dummy chip by using an adhesive material; and

a plurality of bonding wires connecting between said die and an end of said plurality of first leads over said dummy chip.

REMARKS

The present amendment is in response to Paper No. 2, the Office Action mailed October 10, 2001, in which Claim 1-7 are rejected. Applicant has thoroughly reviewed the outstanding Office Action including the Examiner's remarks and the references cited therein. The following remarks are believed to be fully responsive to the Office Action and, when coupled with the above amendments, are believed to render all claims at issue patentability distinguishable over the cited references.

The specification and Claim 1 are amended herein. Accordingly, Claims 1-7 are pending.

Applicant respectfully requests reconsideration in light of the above amendments and the following remarks.

DRAWING OBJECTIONS

With respect to Paragraph 1 of the Office Action, the drawings are objected to as failing to comply with 37 CFR 1.84 (p)(5) because the reference numeral 22 of Figure 1 is not mentioned in the description.

Applicants have amended the specification as shown above. Specifically, Applicants have inserted at lines 9-10, in the paragraph beginning at line 20 on page 4, the sentence, "The dummy chip 18 includes one or more pads 22 configured around the surface of the dummy chip 18 to connect the inner leads 12." Therefore, Applicants request the correction be entered by the Examiner and the objection withdrawn. With respect to Paragraph 2 of the Office Action, the drawings are objected to under 37 CFR 1.83 (a). The Examiner states that "the tapes connected between said die and an end of said plurality of first leads over said dummy chip" must be shown in the drawings or the feature is canceled within the claim(s).

As shown above, Applicants have amended Claim 1 to replace, "the tapes connected between said die..." with "a plurality of bonding wires connecting between said die ...", which is supported by the description on page 5, lines 23-24 and Figure 1. Thus, "the tapes connected between said die and an end of said plurality of first leads over said dummy chip" is no longer recited in any claims.

Therefore, applicant respectfully submits that the drawings now comply with the requirements under 37 CFR 1.84 (p)(5) and 37 CFR

1.83 (a). Accordingly, the Applicants request that the Examiner's objections to the drawings be reconsidered and withdrawn.

SPECIFICATION OBJECTIONS

With respect to Paragraph 3 of the Office Action, the Examiner objected to the specification for informalities. Please refer to the amended parts of the specification, which have been corrected as indicated by the Examiner.

With respect to Paragraph 5 of the Office Action, the specification is objected to under 37 CFR 1.71 because the invention as disclosed in the detailed description of the invention is different from the invention in claims 1-7. The Examiner states that the invention discloses a device comprising a die, a dummy chip, a plurality of first leads and tapes of adhesive material among other elements, in an arrangement where the plurality of first leads is connected to the dummy chip through the tapes of adhesive material, while Claim 1 has the tapes connected between said die and an end of said plurality of first leads over said dummy chip.

It is clarified that the recitation in lines 8-9 of the amended Claim 1 is "a plurality of bonding wires connecting between said die and an end of said plurality of first leads over said dummy chip", which is supported by the description on page 5, lines 23-24 and Figure 1. While "the tapes connected between said die and an end of said plurality of first leads over said dummy chip" is no longer recited in the amended

Claim 1 or other claims. Therefore, the recitations of claims 1-7 are consistent with and supported by the disclosure of the description of the present invention.

Applicant respectfully submits that the Examiner's objection to the specification is now overcome and requests that the objections be reconsidered and withdrawn.

CLAIM REJECTIONS 35 USC § 112, FIRST PARAGRAPH

With respect to Paragraph 7 of the Office Action, the Examiner rejected claims 1-7 under 37 USC § 112, first paragraph, as containing subject matter which was not described in the specification for enablement purposes. The Examiner states that the original Claim 1 recites in lines 11-12: "tapes connected between said die and an end of said plurality of first leads over dummy chip", while in the description and the drawings, the tapes connect said plurality of first leads to the dummy chip.

As the above clarification, the recitation in lines 8-9 of the amended Claim 1, referred to lines 11-12 of the original Claim 1, is "a plurality of bonding wires connecting between said die and an end of said plurality of first leads over said dummy chip", which is supported by the description on page 5, lines 23-24 and Figure 1. While "the tapes connected between said die and an end of said plurality of first leads over said dummy chip" is not recited in the amended Claim 1 and other

claims. Therefore, the reconsideration and withdrawal of the Examiner's objection to claims 1-7 under 35 USC § 112, first paragraph is requested.

CLAIM REJECTION 35 USC § 112, SECOND PARAGRAPH

With respect to Paragraph 9 of the Office Action, the Examiner rejected claims 1-7 under 35 USC § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner states that the recitation in lines 11-12 of Claim 1: "tapes connected between said die and an end of said plurality of first leads over said dummy chip" is vague, and suggested to change "connected between" to "disposed between" or "connecting".

The recitation in lines 11-12 of the original Claim 1 is amended to a plurality of bonding wires connecting between said die and an end of said plurality of first leads over said dummy chip, which is referred to the amended Claim 1, lines 8-9, as suggested by the Examiner. Therefore, reconsideration and withdrawal of the Examiner's objection to claims 1-7 under 35 USC § 112, second paragraph is requested.

CLAIM REJECTIONS 35 USC § 103 (a)

With respect to Paragraph 11 of the Office Action, the Examiner rejected claims 1-7 under 35 USC 103 (a) as being unpatentable over

Ohno et al. (US Patent No. 5,227,662) in view of Lee et al. (US Patent No. 6,087,722). Claim 1 is independent and claims 2-7 are dependent upon Claim 1.

Applicant respectfully traverses this rejection.

As claimed in the amended Claim 1 and referring to FIG. 1, the present invention provides a leadframe package with dummy chip, which comprises a leadframe with a plurality of first leads, a molding compound, a dummy chip and a die. The molding compound encapsulates the die and the dummy chip. The dummy chip is arranged on a lower portion of the molding compound and the die is stacked on an upper surface of the dummy chip by using an adhesive material. A plurality of bonding wires connects between the die and an end of the plurality of first leads over the dummy chip.

The purpose of the cited reference, Ohno et al., is to provide a composite lead frame with an excellent heat dissipation characteristic, which is suitable for manufacturing a semiconductor device having a large number of pins. See col. 5, lines 26-45 and FIG. 7, the composite lead frame of Ohno et al. comprises a lead frame 10, leads 28 supported on a plastic film 22' having a device hole 24, and a heat sink 40 formed of SiC or AlN for mounting a semiconductor chip 34. The lead frame 10 has a plurality of inner lead portions 12, each of which is bonded to one of the leads 28. The heat sink 40 supports the leads 28 through the plastic film 22'. An adhesive tape 16 is bonded between the heat sink

40 and the inner lead portions 12 of the lead frame 10 and between the heat sink 40 and the plastic film 22'. The semiconductor chip 34 is directly mounted on the heat sink 40, and is connected to the leads 28 through bonding wires 36. The semiconductor chip 34 and the lead frame 10 around the chip 34 are sealed with resin 38, and the bottom surface of the heat sink 40 is exposed after the resin 38 is applied.

The connection of the lead frame 10 to the semiconductor chip 34 is performed through the leads 28, width and pitch of the inner lead portions 12 of the lead frame 10 need not be narrow. And, the heat sink 40 formed of SiC or AlN having a high thermal conductivity provides an excellent heat dissipation characteristic. Therefore, by means of the above structural features, Ohno et al. provides a composite lead frame with an excellent heat dissipation characteristic, which is suitable for manufacturing a semiconductor device having a large number of pins.

The cited reference, Lee et al., teaches that using an adhesive 92 to attach a second chip 71 to a die pad 82 (see FIG.1), and using an adhesive 41 to attach a first chip 11 to a second chip 21 (see FIG. 2).

In accordance with the foregoing, the combination of Ohno et al. and Lee et al. does not provide a lead frame structure like that of the present invention. In Ohno et al, the lead 28, connecting with the inner lead portion 12, connects to the semiconductor chip 34 through the bonding wire 36. The inner lead portion 12 of the lead frame 10 of Ohno et al. does not connect to the semiconductor chip 34, which is different

from the present invention that the inner lead of the lead frame connects to the die directly through the bonding wire.

Moreover, the lead frame 10 of Ohno et al. utilizes the lead 28 to connect to the semiconductor chip 34 through the bonding wire 36. As a result, the width and pitch of the inner lead portion 12 of the lead frame 10 need not be narrow, and thereby making the lead frame 10 being suitable for being used in a semiconductor device having a large number of pins. In case that the leads 28 and plastic film 22' are omitted from the structure provided by the combination of Ohno et al. and Lee et al., the above purpose of the lead frame 10 of Ohno et al. would be destroyed. Therefore, the disclosures of Ohno et al. and Lee et al. are uncombinable.

Accordingly, the claimed invention is not obvious for one-skilled in the art in view of Ohno et al. and Lee et al., whether standing alone or in combination. The amended Claim 1 is patentably distinguishable over the two cited references. Withdrawal of this rejection is respectfully requested, and allowance of amended independent Claim 1 is earnestly solicited.

Furthermore, claims 2 through 7, which depends upon amended independent Claim 1, incorporates all the limitations of the amended Claim 1, and other additional limitations. Thus, for reasons discussed above, Applicant respectfully submits that dependent claims 2 through

7 patentably distinguish over Ohno et al. in view of Lee et al. Allowance of claims 2 through 7 is respectfully requested.

CONCLUSION

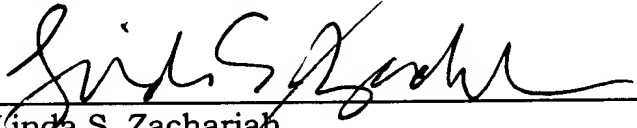
In light of the above amendments and remarks, Applicant respectfully submits that all of pending claims 1 through 7 as currently presented are in condition for allowance. Favorable reconsideration is respectfully requested.

Attached hereto is a marked up version of the changes made to the specification and claim by current amendment. The attached page is captioned **"Version with markings to show changes made."**

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN

Date: 2/8/02


Linda S. Zachariah
Reg. No. 48,057

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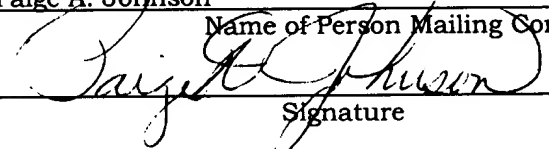
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